High-Performance Computing in the Space Sciences Directorate

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Background

- Access to supercomputers by SSD scientists has been very limited
  - Historically, high-performance computing at SSD has been limited to dedicated workstations
  - HPC needs keep growing: current and planned projects call for computational resources well beyond those available
- SSD Visiting Committee Recommendations
  - VC on Data Analysis & Archiving (Feb. 2002)
    - The SSD should develop a set of consolidated high performance computing requirements and propose a strategy to meet these requirements, to be given to Code S for their approval and support.
  - VC on LWS and LISA (Jan 2003)
    - Provide continued support for the computational and computer science aspects of source modeling
- Fall'02 – Spring'03 - Survey of key SSD researchers'
  - HPC needs Feb. 03 - SSD HPC requirements workshop
  - Results documented in SSD HPC Plan (3yr projection)

SSD HPC Requirements

- Examples of unfunded or underfunded computing needs but Project or R&A competitive research activities:
  - Gravitational Wave Modeling (GWM)
  - Galaxy formation and stellar evolution
  - Radiative transfer of dust emissions
  - Turbulence in the solar wind
  - Kinetic and MHD simulations of the magnetosphere
  - Ray tracing of continuum radiation in magnetospheric plasmas
  - Dynamic models of the radiation belts
- Computing is also needed to test ideas for future research
  - Some research is also “unaffordable” due to the lack of computing resources
- Nearly all SSD *medium* scale supercomputing requirements suited for Beowulf scale computing
  - SSDOO under took a grass roots effort to support this type of computing

New SSD HPC Strategy

- BLISS - Supported by LHEA
  - For exclusive use of Gravitation Wave modeling group
- THUNDERHEAD - Open to everyone in SSD!
  - Developed for "Grand Challenges" in NASA sciences
  - Program ended October 1, 2004
  - Partial funding for support in FY05 found
    - System Admin (1.5) - short about $100K
    - Algorithm support and website development (1.5 FTE/AETD)
    - Some Hardware/software - short about $25K
  - System will be managed by the NEW IT Services organization
- THUNDERHEAD viewed as a "steeping stone" to Project Columbia computing
  - Operation codes port to Project Columbia
- Project Columbia
  - NASA's investment in HPC at AMES for the entire Agency
  - Must get an approved account & run primarily in production mode

Support for THUNDERHEAD

- THUNDERHEAD will be needed for:
  - Code development
  - Visualization
  - Local modeling with quick turn around
  - Without future $ support system will be turned off
- Need to start planning for proposing operational costs for THUNDERHEAD in upcoming ROSES NRA call in Jan.
  - The more users the less the proposed cost
  - Cost per user/group TBD
- Total costs depends on levels of support
  - System Administration, User support, web maintenance….etc.
- User group need to be defined to set policy usage and services needed before costs can be determined